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SuperCDMS IMPACT: Measuring the sub-keV Ionization Yield in Cryogenic Solid-State Detectors

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The SuperCDMS collaboration uses cryogenic silicon and germanium detectors to directly search for dark matter. Nonbaryonic dark matter in the mass range of 1-10 GeV/c² that interacts primarily through nuclear recoils will deposit less than a keV of energy in detectors. These energy depositions will produce phonons and electron-hole pairs. The electron-hole pairs are accelerated across the crystal by an applied voltage, producing more phonons and thus amplifying the signal via the Neganov-Trofimov-Luke (NTL) effect. The number of electron-hole pairs produced per unit energy, called the ionization yield, is a central quantity for reconstructing the recoil energy and for properly modeling the dark matter signal. However, it has not been well-characterized for sub-keV nuclear recoils. IMPACT (Ionization Measurement with Phonons At Cryogenic Temperatures) is a neutron scattering measurement that aims to measure the ionization yield in cryogenic solid-state detectors. This talk will describe the first data taking campaign at the Triangle Universities Nuclear Laboratory (TUNL) and the ongoing analysis of that data.

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